National Institute of Environmental Health Sciences

Predicted altitudinal shifts and reduced spatial distribution of Leishmania infantum vector species under climate change scenarios in Colombia

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Abstract:

Visceral leishmaniasis (VL) is caused by the trypanosomatid parasite Leishmania infantum (Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin)Leishmania chagasi), and is epidemiologically relevant due to its wide geographic distribution, the number of annual cases reported and the increase in its co-infection with HIV. Two vector species have been incriminated in the Americas: Lutzomyia longipalpis and Lutzomyia evansi. In Colombia, L. longipalpis is distributed along the Magdalena River Valley while L. evansi is only found in the northern part of the Country. Regarding the epidemiology of the disease, in Colombia the incidence of VL has decreased over the last few years without any intervention being implemented. Additionally, changes in transmission cycles have been reported with urban transmission occurring in the Caribbean Coast. In Europe and North America climate change seems to be driving a latitudinal shift of leishmaniasis transmission. Here, we explored the spatial distribution of the two known vector species of L. infantum in Colombia and projected its future distribution into climate change scenarios to establish the expansion potential of the disease. An updated database including L. longipalpis and L. evansi collection records from Colombia was compiled. Ecological niche models were performed for each species using the Maxent software and 13 Worldclim bioclimatic coverages. Projections were made for the pessimistic CSIRO A2 scenario, which predicts the higher increase in temperature due to non-emission reduction, and the optimistic Hadley B2 Scenario predicting the minimum increase in temperature. The database contained 23 records for L. evansi and 39 records for L. longipalpis, distributed along the Magdalena River Valley and the Caribbean Coast, where the potential distribution areas of both species were also predicted by Maxent. Climate change projections showed a general overall reduction in the spatial distribution of the two vector species, promoting a shift in altitudinal distribution for L. longipalpis and confining L. evansi to certain regions in the Caribbean Coast. Altitudinal shifts have been reported for cutaneous leishmaniasis vectors in Colombia and Peru. Here, we predict the same outcome for VL vectors in Colombia. Changes in spatial distribution patterns could be affecting local abundances due to climatic pressures on vector populations thus reducing the incidence of human cases.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

General Geographical Feature

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Central/South America

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Fly-borne Disease

Fly-borne Disease: Leishmaniasis

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Socioeconomic Scenario: SES scenarios

Timescale:

time period studied

Long-Term (>50 years)